

WHAT IS CLAIMED IS (US) :

1. An electric field generating element, comprising:
a light source; and
a substrate having formed thereon a conductive member,

wherein said conductive member includes a constricting section for narrowing down a current path;
and

a near field is generated at said constricting section by applying a light beam from said light source to said constricting section.

2. The electromagnetic field generating element as set forth in claim 1, wherein:

said constricting section is formed in thickness of not more than a wavelength of the light beam emitted from said light source to said constricting section.

3. The electromagnetic field generating element as set forth in claim 1, wherein:

a surface of said constricting section on an opposite side to an interface with said substrate is covered with a coating layer at least at a portion where said constricting section is formed, said coating layer having an index of refraction substantially a same as that of said substrate.

4. The electromagnetic field generating element as set

forth in claim 1, wherein:

said conductive member has three terminals connected at one location, which extend in a radial pattern from a connected part.

5. The electromagnetic field generating element as set forth in claim 4, wherein:

respective angles formed by a current path of a terminal at a center among said three terminals and current paths of terminals on both sides are acute.

6. The electromagnetic field generating element as set forth in claim 1, wherein:

said conductive member has four terminals connected at one location, which extend in a radial pattern from a connected part.

7. The electromagnetic field generating element as set forth in claim 1, wherein:

fine particles of metal are applied onto a surface around a portion where said constricting section is formed.

8. The electromagnetic field generating element as set forth in claim 7, wherein:

said metal of said fine particles is Au, Cu, Pt or Ag, or said fine particles are dielectric fine particles coated with Au, Cu, Pt or Ag.

9. The electromagnetic field generating element as set forth in claim 1, wherein:

a soft magnetic layer is formed between said conductive member and said substrate.

10. The electromagnetic field generating element as set forth in claim 9, wherein:

said soft magnetic layer is a soft magnetic insulating member.

11. The electromagnetic field generating element as set forth in claim 1, wherein:

an insulating layer and an electrically conductive metal layer are formed between said conductive member and said substrate in this order from the side of said substrate.

12. The electromagnetic field generating element as set forth in claim 11, wherein:

said constricting section is formed by opposed two recessed sections which respectively extend from both sides in a direction orthogonal to a current direction of said conductive member along a laminated surface.

13. The electromagnetic field generating element as set forth in claim 12, wherein:

the electrically conductive metal layer has recessed sections substantially in shape along the recessed sections

of said conductive member, and

a most dented portion of the recessed sections of said conductive member and a most dented portion of the recessed section of said electrically conductive metal layer formed substantially in shape of the recessed sections of said conductive member are aligned in a direction vertical to the surface of said substrate.

14. The electric field generating element as set forth in claim 12, wherein:

said recessed sections are formed substantially semi-circular in shape.

15. The electric field generating element as set forth in claim 14, wherein:

said constricting section has a line width m that is a distance between rims at a narrowest portion of said conductive member, and a length twice as long as a diameter $2a$ of each of said recessed sections that is substantially semi-circular in shape.

16. The electric field generating element as set forth in claim 12, wherein:

said electrically conductive metal layer has a single recessed section that extends along respective recessed sections of the conductive member from one of the recessed sections to the other recessed section, and a most dented portion of the recessed section of said electrically

conductive metal layer is located on the side of the other recessed section of said conductive member.

17. The electromagnetic field generating element as set forth in claim 1, wherein:

said light source is a semiconductor laser element, and said semiconductor laser element and said conductive member are formed in one integral part.

18. An information recording and reproducing head, comprising:

an electric field generating element which includes a light source, and a substrate having formed thereon a conductive member,

wherein said conductive member includes a constricting section for narrowing down a current path; and a near field is generated at said constricting section by applying a light beam from said light source to said constricting section a near field is generated at said constricting section by applying a light beam from said light source to said constricting section; and

an electromagnetic field detector for detecting a light beam,

wherein information is recorded on an information recording medium at a predetermined position with an application of a magnetic field generated at said constricting section as heated by said near field from said constricting section and information recorded on the

information recording medium as heated by said near field is reproduced by detecting by said electric field detector, a reflected light of the light beam applied to said constricting section from said light source.

19. An information recording and reproducing head, comprising:

an information recording and reproducing head which comprises: an electric field generating element including a light source, and a substrate having formed thereon a conductive member,

wherein said conductive member includes a constricting section for narrowing down a current path; and a near field is generated at said constricting section by applying a light beam from said light source to said constricting section, and

an electromagnetic field detector for detecting a light beam,

wherein information is recorded on an information recording medium at a predetermined position with an application of a magnetic field generated at said constricting section as heated by said near field from said constricting section and information recorded on the information recording medium as heated by said near field is reproduced by detecting by said electric field detector, a reflected light of the light beam applied to said constricting section from said light source; and

moving means for moving said information recording

and reproducing head to a predetermined position on said information recording medium.